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Original article

How was spinal surgery activity maintained during the COVID-19 pandemic? Results of a French multicenter observational study

Benjamin Blondel^a, Solène Prost^a, Dominique Chaussemy^b, Yann Mohsinaly^c, Soufiane Ghailane^d, Hughes Pascal-Moussellard^c, Richard Assaker^e, Cédric Barrey^f, Olivier Gille^d, Yann-Philippe Charles^g, Stéphane Fuentes^{a,*}

^a Unité de chirurgie rachidienne, APHM, CNRS, ISM, CHU de Timone, Aix-Marseille Université, 264, rue Saint-Pierre, 13005 Marseille, France

^b Service de neurochirurgie, université de Strasbourg, hôpital de Hautepierre, 1, avenue Molière, 67200 Strasbourg, France

^c Université Pierre et Marie Curie, Hôpital Pitié-Salpêtrière, 47–83, boulevard de l'hôpital, 75013 Paris, France

^d Unité de pathologie rachidienne, université de Bordeaux, hôpital Pellegrin, place Amélie-Raba-Léon, 33076 Bordeaux cedex, France

^e Service de neurochirurgie, université de Lille, avenue du Professeur Emile-Laine, 59037 Lille, France

^f Service de chirurgie du Rachis, université Claude-Bernard de Lyon 1, hospices civils de Lyon, 59, boulevard Pinel, 69677 Bron, France

^g Service de chirurgie du rachis, université de Strasbourg, hôpital de Hautepierre, 1, avenue Molière, 67200 Strasbourg, France

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ABSTRACT

Introduction: The French Society of Spinal Surgery (SFCR) offered guidelines during the COVID pandemic. The objective of this work was to report the organization and activity in spinal surgery during the first month of confinement across 6 centers in France. The secondary objective was to monitor the adequacy of our practices within the SFCR guidelines.

Material and methods: This prospective multicenter observational study reported spinal surgery activity in each institution from March 16 to April 16, 2020, as well as the organizational changes applied. Surgical activity was compared to that of the same period in 2019 in each center and evaluated according to the SFCR guidelines, in order to control the adequacy of our practices during a pandemic period.

Results: During the peak of the epidemic, 246 patients including 6 COVID-positive patients were treated surgically. The most significant drops in activity were found in Strasbourg (–81.5%) and Paris (–65%), regions in which the health situation was the most critical, but also in Bordeaux (–75%) despite less viral circulation. Operating rooms functioned at 20 to 50% of their normal capacity. There was a significant reduction in procedures for degenerative spine conditions or deformities, in line with the SFCR guidelines.

Conclusion: Maintaining spinal surgery is possible and desirable, even in times of health crisis. The indications must be considered according to the emergency criteria developed by learned societies and adapted to health developments and to the technical possibilities of treatment, by center.

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1. Introduction

The COVID-19 pandemic began in China in December 2019 with the first case reported in France on January 24, 2020. The epidemic progressed globally, starting in the east of France, justifying a declaration for a pandemic from The World Health Organization on March 11, 2020 [1], and triggering the national white plan on March 13, 2020, in France. According to the epidemic risk management plan [2] a transition to stage 3 was carried out on March 14, 2020, resulting in a national confinement on March 17, 2020.

According to the directives of the Regional Health Agencies [3], the transition to a “white plan” for health establishments ensured the deprogramming of any non-urgent surgical or medical activity, to avoid loss of chance for patients.

However, despite limited access to the operating room, it remained essential to continue the care of urgent patients or patients with potential loss of chance. In order to help spine surgeons, the French Society of Spinal Surgery (SFCR) proposed management guidelines for spinal surgery patients in times of COVID-19 crisis [4]. Prioritization of surgical procedures has therefore been established at 3 levels: urgent surgeries, surgeries with potential loss of chance (deferred emergencies) and non-urgent surgeries. The objective of this prioritization was to organize the continuation of recourse activities, which is not exhaustive and

* Corresponding author.
E-mail address: sfuentes@ap-hm.fr (S. Fuentes).

must be adapted to the local conditions of each health establishment and to the progress of the pandemic.

The objective of this work was to report the organization and activity in spinal surgery during the first month of confinement of 6 specialized centers in France located in different zones of viral circulation. The secondary objective was to monitor the adequacy of our practices with the SFCR guidelines. Our working hypothesis was based on the fact that in regions less impacted by the health crisis, it was still possible to maintain surgical recourse activity under the guidance of a dedicated organization.

2. Material and methods

This multicenter observational study included the University Hospitals of Marseille, Bordeaux, Strasbourg, Paris (La Pitié-Salpêtrière), Lille and Lyon including orthopedic surgery and/or neurosurgery departments depending on the city.

Between March 16 and April 16, 2020, the overall spinal surgical activity in each institution, as well as the associated organizational changes during the peak of the first wave of the COVID-19 pandemic, were prospectively collected. The procedures were then differentiated into “simple”, “intermediate” or “complex” surgery for each center. The reorganization of each center (number of operating rooms available) was noted, as was the percentage of operations performed by an experienced (> 35 years old) or younger (\leq 35 years old) surgeon.

For each city, the epidemic status related to COVID-19 was assessed (number of hospitalized patients and number of patients in intensive care at the peak of the epidemic) and for each patient, the viral status (COVID-negative or COVID-positive) in the preoperative phase was systematically assessed by a PCR test.

Additionally, the surgical activity resulting from the first month of confinement was compared to that of the same period in 2019 in each center to assess the impact of the decline in activity and its causes. Finally, surgical activity during the confinement period was assessed according to the SFCR guidelines to monitor the adequacy of our practices during the pandemic.

3. Results

3.1. Assessment of the COVID-19 epidemic by region

The first wave of COVID-19 did not affect France evenly, and some regions were hit hard while others relatively spared.

At the peak of the epidemic, the Grand-Est region (4,702 hospitalizations, 960 patients in intensive care) and the Ile de France (12,479 hospitalizations, 2,668 patients in intensive care) were in very active areas of circulation of the virus.

The Auvergne-Rhône Alpes region (3,030 hospitalizations, 783 intensive care patients), Hauts de France (2,336 hospitalizations, 583 intensive care patients) and Provence Alpes Côte d'Azur (1,804 hospitalizations, 441 intensive care patients) were areas in which the viral circulation was a little less intense.

The Nouvelle Aquitaine region had lower viral circulation (815 hospitalizations, 264 patients in intensive care).

3.2. Reorganization of spinal surgery departments

From March 16, 2020, a reorganization of the various departments was necessary, resulting in operative deprogramming, unit closures and the transformation of double hospital rooms into single rooms. For operating rooms, a significant decrease was noted across all centers, with capacity ranging from 20–50% of normal capacities. Thus, only 20% of spinal theaters were open in Bordeaux (0.5 vs. 2.5 theaters), 25% in Strasbourg (1 vs. 4 theaters), 33% in

Marseille (1 vs. 3 theaters) and Paris (0.5 vs. 1.5 theaters), and 50% in Lyon (1 vs. 2 theaters). The opening of wards was correlated with resuscitation activity, with the transformation of recovery rooms into temporary COVID resuscitations in cluster regions.

3.3. Surgical activity

In total, at the peak of the epidemic, 246 patients including 6 COVID-positive patients were treated surgically at the 6 centers, within the inclusion period (Table 1). The comparison with data for the same period of 2019 showed a 66% decrease in spinal surgical activity (724 patients operated on in 2019) with variability between centers. The most significant drops in activity were found in Strasbourg (–81.5%) and Paris (–65%), regions where the health situation was most critical, but also in Bordeaux (–75%) despite lower viral circulation.

The identification of “simple” procedures showed a significant decrease in herniated disc surgeries (cervical and lumbar) as well as decompressions for lumbar spinal stenosis (Table 2).

“Intermediate” (Table 3) and “Complex” (Table 4) procedures were significantly reduced across all centers. The significant reduction in surgical procedures linked to degenerative phenomena and vertebral deformities was in line with the SFCR guidelines (level 3, non-urgent procedures). Similarly, the procedures carried out at the various centers during confinement corresponded to the recommendations (level 1 and 2 procedures, urgent or potential loss of chance). A sharp decline in spinal trauma activity was also found, due to confinement. Some compression fractures were treated conservatively in cluster regions, while these patients underwent minimally invasive surgeries (cementoplasties or vertebral expansions which include kyphoplasty, spinejack and other techniques) during normal times.

Data on the age of surgeons were obtained for 4 centers and reflected different strategies. Thus, in Marseille and Strasbourg, an increase in the proportion of surgeries performed by senior surgeons was noted (60% in 2019 vs. 80% in 2020 in Marseille, 86% in 2020 in Strasbourg). Conversely, in Paris and Bordeaux an increase in procedures performed by surgeons under the age of 35 was reported (54% in 2019 vs. 72% in 2020 in Bordeaux, 48% in 2019 vs. 56% in 2020 at Paris).

3.4. Evolution during the first wave of the epidemic

Out of all the centers included in the study, two patients had a positive COVID PCR test during their hospitalization, one requiring transfer to a dedicated unit and one requiring medical surveillance in the surgical department with appropriate measures. No case of spinal surgeon contamination was reported. The management of COVID-positive patients presenting with an urgent surgical indication required management in a dedicated operating room, strictly isolated from the operating rooms for COVID-negative patients.

4. Discussion

The COVID-19 pandemic led to a major change in the management of patients with spinal pathology. The measures to fight the health crisis included confinement of the population and reorientation of system resources for the care of COVID-positive patients.

Regarding spinal surgery, recommendations have been issued by various learned societies in an attempt to select patients requiring surgical management. Thus, the Rothman Institute in the USA [5] or the SFCR [4] have established a stratification system across 3 levels:

Urgent surgeries:

Table 1
Number of operations per center in 2019 and 2020 during the inclusion period. The figure in brackets corresponds to the number of COVID-positive patients operated on.

Etiology	Marseille		Bordeaux		Strasbourg		Paris		Lille		Lyon	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Tumor	15	15	9	2	7	4	7	4	2	3	9	8
Trauma	36	5	21	9	12	11	12	11	14	9	8	9
Degenerative	80	36	144	22	89	10	52	10	75	30	70	19
Infection/Postoperative complications	8	6	15	13	5	0	9	5	6	4	11	5
Total	149	62 (1)	189	46 (1)	114	21 (2)	77	30 (2)	97	46	98	41

Table 2
"Simple" procedures (number of procedures), patients could have been operated on several times.

Simple procedure	Marseille		Bordeaux		Strasbourg		Paris		Lille		Lyon	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Thoracic disc herniation	0	1	0	0	0	0	0	0	2	2	0	1
Lumbar disc herniation	12	15	23	11	13	4	8	3	23	5	9	4
Cervical disc herniation	21	4	19	1	12	1	13	4	17	8	19	7
Lumbar spinal canal stenosis	22	7	44	2	15	5	6	2	12	3	11	2
Foraminotomy	0	4	6	0	0	0	0	0	2	0	0	0
Infections	10	3	7	10	2	0	9	5	6	4	8	5
Biopsy	0	2	0	0	0	0	0	0	0	0	0	1
Total	65	36	99	24	32	10	36	14	62	22	47	20

Table 3
"Intermediate" procedures (number of procedures).

Intermediate procedure	Marseille		Bordeaux		Strasbourg		Paris		Lille		Lyon	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Short posterior fixation	29	14	63	12	34	0	16	11	16	11	7	7
Cimentoplasty, kyphoplasty	5	4	0	0	2	0	0	1	4	1	0	0
Spinal expansion (Spinejack)	22	5	4	1	2	0	0	0	0	0	0	0
One level inter-somatic arthrodesis	10	1	9	0	28	0	15	4	9	1	21	3
Total	66	24	78	13	66	0	31	16	29	14	28	10

Table 4
"Complex" procedures (number of procedures).

Complex procedure	Marseille		Bordeaux		Strasbourg		Paris		Lille		Lyon	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Malunion	1	3	0	0	0	0	1	0	0	6	0	0
Vertebrectomy	6	3	0	0	4	0	1	0	2	3	3	2
Deformation	8	0	16	1	16	0	6	0	4	4	20	9
Total	15	6	16	1	20	0	8	0	6	13	23	11

- cervical or lumbar radiculopathy with deficits;
- herniated disc with cauda equina syndrome;
- epidural hematoma;
- infectious pathology with epidural abscess;
- spinal trauma with neurological deficit;
- spinal metastasis with neurological deficit.

Potential loss of chance surgeries:

- hyperalgesic radiculopathy (requiring hospitalization);
- cervical spondylosis with myelopathy and rapidly progressive neurological disorders;
- unstable, non-neurological spinal metastases;
- non-neurological spinal trauma.

Elective surgeries:

- chronic painful degenerative pathologies with no neurological deficit (chronic non-deficient radiculopathy, disc pathology, uncomplicated lumbar spinal stenosis, uncomplicated spondylolisthesis);
- spine deformity surgery;

- revision for osteosynthesis failure.

At the same time, protective measures for operating theaters, personal protective equipment for staff and the patient pathway have been reported [6–8]. The COVID-19 health crisis led authorities to focus the majority of resuscitation resources on managing infected patients. This directly affected the operating capacities due to the massive involvement of anesthetists, anesthesia nurses (AN) and the requisition of ventilators from operating theaters.

The results of our multicenter study shed light on the type and volume of spinal surgery undertaken in France during the confinement period. There was an overall decrease of 66% in surgical activity, with a major decrease linked to health pressure in the Grand Est and Île de France. An analysis of the indications for surgery revealed a reduction in trauma that could be explained by the confinement limiting accidents, on the road, and during leisure activities. In addition, surgical practices were consistent with SFCR guidelines, as evidenced by the major drop in indications for degenerative pathologies.

The age of the surgeons highlighted disparities between the centers that could indicate two crisis management strategies. On the one hand, in some centers, operations were performed by senior

surgeons at the center, in order to limit operating times and optimize the occupancy of operating rooms. On the other hand, in other centers, senior surgeons were mainly occupied with the administrative management of the health crisis, delegating more surgical management to junior surgeons. In cluster regions, a system was organized for COVID patients, amongst anesthetists and surgeons, to allocate tasks according to the skills required, and to optimize the care of intubated and ventilated patients by doctors and nursing staff competent in intensive care [9]. The role of the surgeons was to ensure communication with the families of isolated patients in intensive care, to help the regular turnover of patients for ventilation in prone position and to help in the logistics of the patient pathway during a period of high influx of patients infected with SARS-CoV-2.

The reduction in surgical activity associated to the COVID-19 pandemic has also been reported in recent literature [10], sometimes with delayed resumption to normal activity [11]. However, this resumption is sometimes faster, leading to a rebound in secondary activity. Thus, the analysis of post-deconfinement activity data in Marseille between June and October 2020 compared to 2019 showed an average increase of 15.5% in spinal surgical activity with peaks of +30% during the summer months, linked to a significant increase in trauma. This type of rebound in activity is also, in itself, likely to disrupt the management of patients with spinal pathology. Indeed, the increase in trauma emergencies can complicate and delay the reprogramming of patients canceled during the first wave, leading to increased risk of complications and poor functional results [12,13].

This study does however have limitations such as its observational nature and its short duration of inclusion, but its findings still require consideration when addressing further waves of the pandemic in the country and when anticipating the resumption of subsequent activity.

5. Conclusion

Maintaining spinal surgery is possible and desirable even in times of health crisis. It must be discussed and well organized with the various individuals involved (anesthetists, surgeons and infectious disease specialists). The indications must be considered according to the emergency criteria developed by learned societies and adapted to health developments, and to the technical possibilities of treatment by center. Minimally invasive strategies by experienced surgeons should be favored.

Disclosure of interest

The authors declare that they have no competing interest.

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Contribution

B Blondel, S Prost, YP Charles and S Fuentes wrote the manuscript.

All the authors have reviewed and approved the manuscript.

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